

RECLAMATION

Managing Water in the West

New Melones Lake Marina Siting Plan



U.S. Department of the Interior
Bureau of Reclamation
Mid-Pacific Region
Central California Area Office
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Mission Statements

The mission of the Department of the Interior is to protect and provide access to our Nation's natural and cultural heritage and honor our trust responsibilities to Indian Tribes and our commitments to island communities.

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

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Abbreviations and Acronyms

ADA	Americans with Disabilities Act
APCD	Air Pollution Control District
ARB	Air Resources Board
CEQA	California Environmental Quality Act
CIWMB	California Integrated Waste Management Board
CSS	Commercial Services Study
CUPA	Certified Unified Program Agency
DTSC	Department of Toxic Substances Control
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FFE	Financial Feasibility Evaluation
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NPDES	National Pollutant Discharge Elimination System
OSPR	Office of Spill Prevention and Response
PRC	Public Resources Code
PWC	personal water craft
RMP	Resource Management Plan
RWQCB	Regional Water Quality Control Board
SHPO	State Historic Preservation Officer
WROS	Water Resources Opportunities Spectrum
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service

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Chapter 1

New Melones Lake Marina

1.1 Introduction

New Melones Lake is operated by the Bureau of Reclamation (Reclamation) for multiple purposes, including flood control, irrigation and municipal water supplies, hydroelectric production, recreation, water quality, and fish and wildlife enhancement. As one of the primary purposes, recreation is a key management consideration at New Melones Lake. The reservoir provides opportunities for both land- and water-based recreation activities. Water-based recreation is popular at the reservoir with its large surface area, which makes it conducive to boating (including houseboating) and related activities. As such, the provision of marina services is an important part of recreation management at the reservoir and is an integral component of the *Commercial Services Study* (CSS) prepared by Reclamation (April 2011).

1.2 Background

Currently, there is one full service marina serving New Melones Lake – the New Melones Lake Marina located at the Glory Hole Recreation Area. The marina operates under a concession agreement with Reclamation, which is set to expire 2012. The marina offers boat slips and mooring for rent, which accommodate both small and large watercraft, including houseboats. The marina maintains a total of 100 small boat slips, both covered and uncovered, which are rented on an annual term. Houseboating is also an integral component of overall marina operations. The marina provides slips and moorings for up to 106 houseboats, including 18 rental houseboats, 38 private houseboats docked in marina slips, and 50 private houseboats docked at mooring balls in the cove. Generally, the demand for marina berthing on the reservoir is high, as evidenced by full occupancy at the marina (and associated waiting list). The marina also offers ancillary services, including motorized watercraft rentals, convenience store, fueling station, and other amenities.

The Haas (2003) visitor capacity study for New Melones Lake identified a number of planning issues that are important for the marina and other potential commercial services:

- Inadequate parking, loading zones, and accessible facilities
- Need for diversity of boat rentals and pricing options
- (Appropriate) number and size of houseboat rentals

- Footprint of the marina exceeding contract agreement
- Long-term exclusive use of private houseboat moorings

These marina-related issues were evaluated as part of the CSS. Based on a comprehensive review of the market for marina facilities in the region, it is clear that there is significant local and regional demand for marina berthing and other amenities, which are not being met at New Melones Lake based on the scale and services offered at the existing marina. Accordingly, new opportunities, such as transient slips, were recommended for consideration at the reservoir.

However, although it is evident that marina operations could expand based on existing demand, the capacity of the lake and related resource considerations must also be considered. The decision to expand the capacity of marina facilities should be made in conjunction with new information on the carrying capacity of the reservoir, which is not available; therefore, no large-scale marina expansion plans were recommended as part of the CSS. The study did conclude, however, that marina services should be provided as part of a single consolidated operation and should include dry boat storage, boat repair, and motorized boat rentals. In addition, non-motorized boat rentals and prepared food service were also identified for consideration as additional features of a consolidated marina facility.

1.3 Problem Definition

Although the CSS concluded that New Melones Lake is best served by a single full-service facility, the proposed location for marina services was not identified and represents a critical management issue. In fact, the study recommended that a more in-depth analysis of marina location be conducted to identify optimal locations for marina facilities. It does recommend, however, that the marina remain in one of the developed recreation areas – Glory Hole or Tuttletown. This marina siting study responds to this management issue.

The primary issues related to marina siting are based upon repeated exposure of the existing marina to strong winter storms and the resultant property damage. The prevailing winds come from the southeast, and based on the layout of the lake, the wind blows over a large stretch of the lake resulting in substantial wave action of up to five- feet high, which laps up against marina facilities resulting in damage to marina facilities and watercraft on the reservoir. During severe storm events, the damage can be substantial. For example, the estimate from a single storm in 2005 totaled approximately \$750,000 in houseboat slip and floating dock damage, excluding private property damages. At its current location, other marina infrastructure is also subject to damage or inoperability from large fluctuations in water levels, including parking lots, propane tanks, sewage tanks, electrical transformers and circuit breakers, and telephone panels.

The purpose of this study is to evaluate the most appropriate location for marina facilities at New Melones Lake based on the recommendation in the CSS that the marina be relocated to a more suitable location while being retained in one of the existing developed recreation areas – Glory Hole or Tuttletown. This study evaluates several potential locations based on coordination with Reclamation staff. The analysis takes into account site-specific characteristics, such as adequacy of wind and wave exposure, adequacy of location and availability/suitability of infrastructure and utilities.

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Chapter 2

Short-listing of Marina Site Alternatives

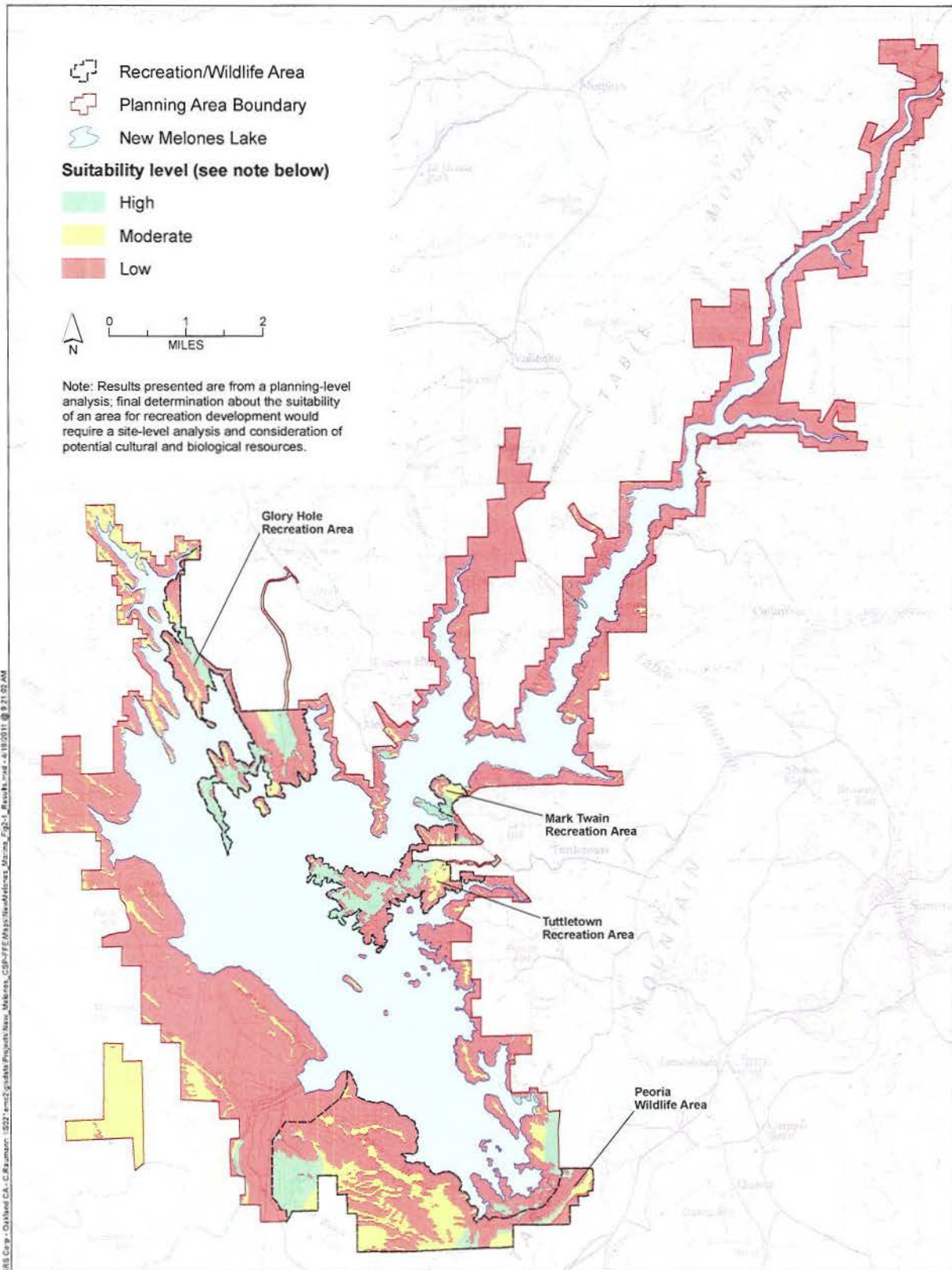
2.1 Background

As part of the CSS, a preliminary geographic information system (GIS) based analysis was conducted with an objective to determine sites potentially suitable for recreation development while considering potential resource constraints. The analysis considered the proximity to existing roads, the Water Resources Opportunities Spectrum (WROS) classification system and the slope of the land. The analysis uses existing data to classify the New Melones Lake planning area into three suitability categories for recreational development: (1) high; (2) moderate; and (3) low (**Figure 2-1**).

Based on this initial analysis, the Project Team was asked to undertake further analysis of potential marina sites as part of a Marina Siting Plan. Building on the preliminary analysis undertaken as part of the CSS, Reclamation identified seven (7) proposed marina sites (inclusive of the current site) for further analysis (**Table 2-1**). The locations of these proposed sites are shown in **Figure 2-2**.

Table 2-1: Proposed Marina Sites

Site Number	Name
1	Existing Marina
2	Angels Creek
3	Black Bart Area
4	Heron Point Area
5	French Flat
6	Old Melones (Old Hwy 49 North)
7	Mark Twain (Old Hwy 49 South)



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Figure 2-1
 Results of site selection analysis

2.2 Proposed Marina Locations

A site visit was undertaken on 3 November 2010 to obtain preliminary information for each of the sites. Information was collected on 1) proximity to roads (need for new roads or road improvements), 2) access to infrastructure (launch ramps, land-based facilities), 3) availability of utilities, 4) exposure to wind (wind fetch), and 5) visual amenity.

Existing Marina (1):

The existing marina serves 106 houseboats including 38 slips and 50 moorings. The prevailing winds at this site come from the southeast and due to the large fetch (almost 30,000 feet) can result in waves above five feet high. During the winter, the winds blow at 50-60 mph sometimes for up to two days. These strong storms batter the marina and result in extensive damages to the houseboat slips, floating docks and private boats. Attempts to construct a breakwater have largely been unsuccessful, and protection from winter storms has relied on moving the marina and boats into more sheltered locations.



Figure 2-3: Existing Marina

In addition to the floating facilities, the existing marina includes: several parking lots with space for about 200 cars; a large propane tank and containment basin; a large sewage tank and containment basin; a 600 amp marina transformer and circuit breaker panel; and a telephone panel. The

utilities are laid on the ground and connect in several connection wells. The marina is served by a maintenance facility, which consists of a large lot with a two bay repair workshop and an adjacent office.

Angels Creek (2):

The proposed Angels Creek site includes an existing launch ramp, a parking lot (with 196 parking spaces), restroom facilities and a power distribution system. The area is well protected from prevailing southeast winds, with a wind fetch of about 3,000 feet at low water.



Figure 2-4: Angels Creek looking beyond the boat ramp

For this site to be developed for the new marina it would need a new water well and water distribution system, a significant extension of the boat launch ramp, and a land based office/storage shed. Several fairly level areas between the access road and the launch ramp could easily be graded and developed to provide additional support for a new marina. These areas had only minimal vegetation.

Black Bart Area (3):

The proposed Black Bart Area is currently a day use area with parking lot (space for approximately 60 cars), restroom facilities, and several day use sites with tables, barbecue pits and water faucets. The area is well protected from the southeast, and wave action will be influenced by summer north westerly winds

where the wind fetch may approach 9,000 feet. However, summer winds are not as extreme as the potential winds associated with winter storms. The area below the parking lot is fairly steep, and its development in the flatter upper parts above or near the parking lot would require the removal of a large number of mature blue oak and interior live oak trees (and likely costly mitigation). However, because of its proximity to the existing marina, this site could be developed partially utilizing the infrastructure serving the existing marina.



Figure 2-5: Black Bart Area viewed from below the car park and amenity block

Development of the Black Bart Area requires an extension of the water and electricity lines, and new septic system, but would use the existing marina boat launch, administration office, maintenance workshop, and water well.

Heron Point Area (4):

The Heron Point Area in the Tuttletown Recreation Area has no infrastructure or access road. Building a marina would require extensive mitigation for areas of mature and heritage manzanita shrubs, as well as blue and interior live oaks that would have to be removed to make space for a new road and support facilities. This area is well protected from southeast winds; however during high water, the flatter areas at this site are all submerged.



Figure 2-6: Heron Point Area showing extensive vegetation that would need to be cleared for development

In addition to extensive clearing of vegetation, development at this site would require a boat launch, access roads, car parks, an administration office and maintenance workshop, a water well and water distribution system, sewer and sewer system, as well as an extension of electricity lines.

French Flat (5):

The French Flat site is in an area of Tuttle town that is not supported by any existing infrastructure. The nearest power source would be likely near some private homes located about a mile to the east. Access to the water is via a poorly maintained track, and development would require the construction of several miles of a new paved road. The area seems to be well protected from southeast winds as the bay is open to the northwest. There are some flatter areas and slopes that could be easily graded into a paved launch ramp.



Figure 2-7: French Flat site viewed across the lake from the Manzanita Campground in the Tuttletown

Development at this site would require a boat launch, extensive access roads, car parks, an administration office and maintenance workshop, a water well and water distribution system, sewer and sewer system, as well as an extension of electricity lines.

Old Melones – Old Hwy 49 North (6):

This is a very steep area accessible from the old and very dilapidated Highway 49. This area has no utilities and very limited expansion potential. The access road would have to be widened and upgraded to reflect current roadway design standards. Additionally, this area is facing a long stretch of open water directly windward into the prevailing southeast winds. This makes it vulnerable to potential wind and storm damage. During the site visit extensive erosion of the existing soil was noted, most likely caused by the wake and wind driven water.



Figure 2-8: Old Melones

Mark Twain – Old Hwy 49 South (7):

The Mark Twain site is located in a narrow valley between the new Highway 49 and the New Melones visitor's center. The area is well sheltered from the southeast (it faces northwest). A small water well and water distribution system are in place for the existing day use area. However, the water system would need to be enlarged to serve a new marina. The most limiting factor at this site is the fairly steep terrain and limited number of level areas that could be developed into parking lots to serve the marina. Further, the bay is also quite narrow and would need to be well planned to provide space both for the houseboat slips and moorings needed by the new marina. The advantage of the site is its easy accessibility from the new Highway 49.



Figure 2-9: Mark Twain looking down the hand launch boat ramp. Old Melones is on the opposite bank

Development of this site would require a new boat launch, new road pavement, an office and repair workshop, an extension and expansion of all utility lines. The old highway 49 pavement would have to be re-built as a launch ramp.

2.3 Approach

From the data collected during the site visit, each of the sites were ranked on five criteria relative to the existing marina. The criteria assessed were:

- 1) Proximity to roads (need for new roads or road improvements),
- 2) Access to infrastructure (launch ramps, land-based facilities),
- 3) Availability of utilities,
- 4) Exposure to wind (wind fetch), and
- 5) Visual amenity.

Each of the sites had already satisfied criteria for slope and land classification, therefore these additional criteria were not assessed as part of this short-listing exercise. The sites were scored from -2 to +2 relative to the existing Marina, based on professional judgment by the Project Team, where:

- 2 Significantly worse
- 1 Slightly Worse
- 0 No Change
- +1 Slight Improvement
- +2 Significant Improvement

2.4 Findings

The findings of the short-listing analysis are summarized in **Table 2-2**.

Table 2-2: Ranking of proposed Marina Sites at NML

	Existing Marina	Angels Creek	Black Bart Area	Heron Point Area	French Flat	Old Melones (Old Hwy 49 North)	Mark Twain (Old Hwy 49 South)
Site #	1	2	3	4	5	6	7
Proximity to roads	0	0	0	-1	-2	-1	0
Access to infrastructure	0	-1	0	-2	-2	-2	-1
Availability of utilities	0	-1	-1	-2	-2	-2	-1
Exposure to wind	0	2	2	2	2	1	2
Visual amenity	0	1	1	1	0	0	0
Available Area	0	0	-1	0	0	0	-2
Total Score	0	1	1	-2	-4	-4	-2

The analysis showed that the two sites with most promise relative to the existing marina are Angels Creek (Site 2) and the Black Bart Area (Site 3). Of the remaining sites considered, the lack of access to infrastructure and limited proximity to roads will render them cost-prohibitive to the existing marina. This is despite their obvious benefits with respect to wind exposure.

2.5 Sites Chosen for Further Analysis

For this report, the Project Team limited further analysis to the Angels Creek and Black Bart locations, in conjunction with opportunities for reducing wind and wave exposure at the existing marina site.

Chapter 3

Specific Marina Siting Criteria

3.1 Site Alternatives Analyzed

The two new site alternatives analyzed were Black Bart and Angels Creek, which were compared to the existing marina (base-case). **Figure 3-1** and **Figure 3-2** show the conceptual design of a marina at Black Bart and Angels Creek respectively.

3.2 Basis of Design

The new marina locations were chosen using the high and low water elevations and bathymetric contours while anticipating the necessary movement of the marina structure associated with fluctuating water levels within the cove. The design low water elevation was established at the 920ft contour. At Angels Creek the location was also chosen based on the proximity to the existing parking and launch area.

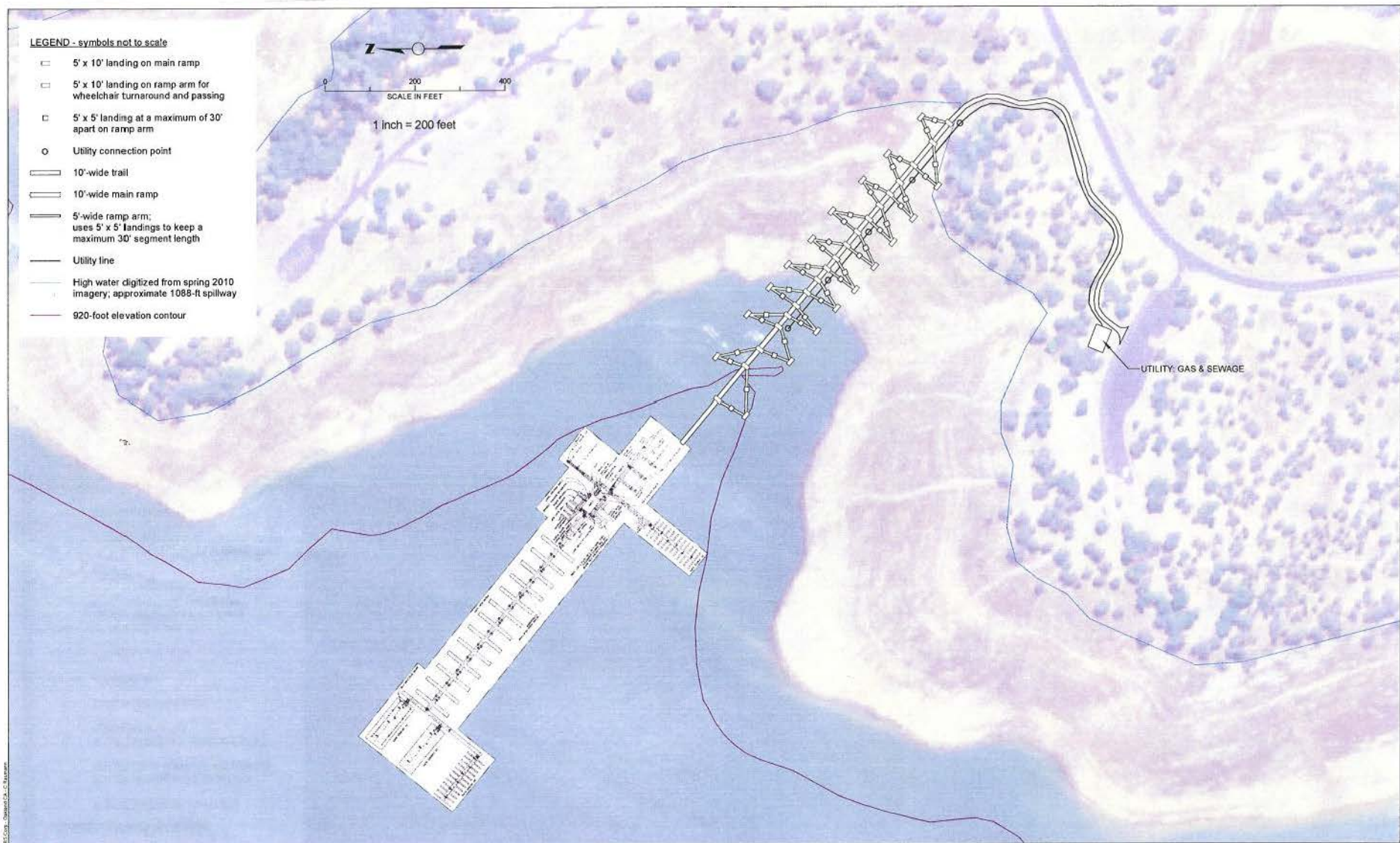
Once the optimal marina location was selected, a pedestrian circulation route was determined beginning at the closest existing parking facility. All proposed pedestrian pathways were designed to meet current ADA standards to include a maximum rise for any ramp run not to exceed 1:12 with a maximum run length of 30ft requiring a landing at the top and the bottom of each ramp run, as well as concrete curbs and guardrails.

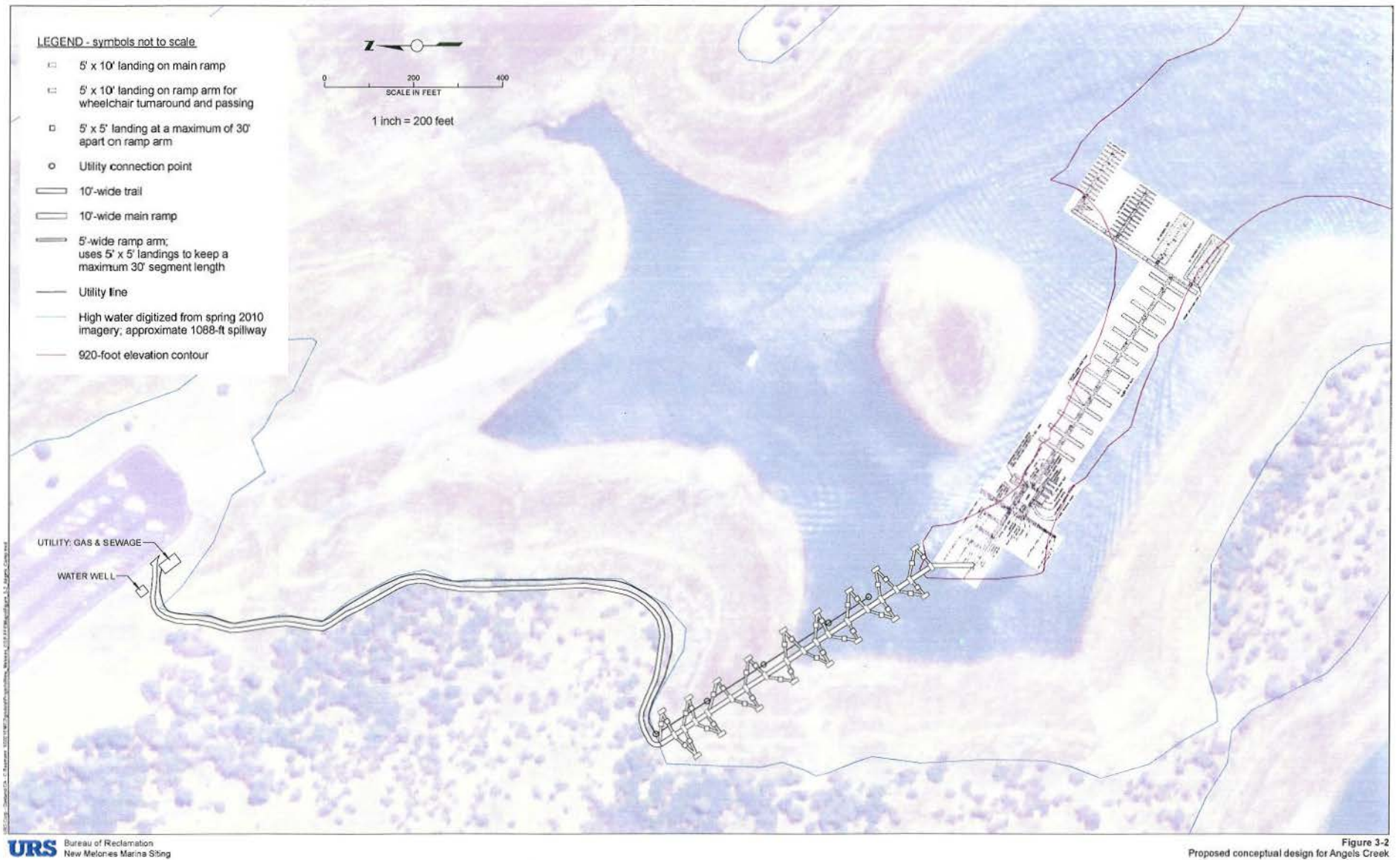
Due to the steep slope, the pedestrian path leading to the proposed marina locations required a “zig zag” design to ensure a maximum 1:12 slope was achieved. Each ramp arm measures approximately 65ft. As soon as the ramp arm reaches the appropriate contour or 30' in length per ADA requirements, a 5' x 5' landing was placed. In addition, a 5' x 10' landing was located at the end of the approximate 65' stretch for wheel chairs to pass and turnaround. A 10ft wide ramp was located down the middle of the “zig zag” path to serve as both maintenance access and a track for the dock walkway to roll forward and backward, up and down the slope during low and high tides.

Facility power lines and electrical connections were sited using existing grades, water elevations and the most direct route to marina facilities.

For Angels Creek, a maintenance building was proposed within the existing temporary beach parking lot due to its proximity to the road and accessibility.

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3.3 Siting Criteria

3.3.1 Adequacy of Exposure:

The exposure of each site to wind and associated wave action was assessed by estimating the longest wave fetch associated with winds from the south-east in winter, or those from the north-west in summer (**Figure 3-3**). The US Army Corps of Engineers Coastal Engineering Manual (2006) gives the wave height H_{m0} and period T_p for a given wind speed and fetch based on the following equations.

$$\frac{gH_{m0}}{u_*^2} = 4.13 \times 10^{-2} * \left(\frac{gX}{u_*^2} \right)^{\frac{1}{2}}$$

and

$$\frac{gT_p}{u_*} = 0.751 \left(\frac{gX}{u_*^2} \right)^{\frac{1}{3}}$$

$$C_D = \frac{u_*^2}{U_{10}^2}$$

$$C_D = 0.001(1.1 + 0.035 U_{10})$$

X = straight line fetch distance over which the wind blows (units of m)

H_{m0} = energy-based significant wave height (m)

C_D = drag coefficient

U_{10} = wind speed at 10 m elevation (m/sec)

u_* = friction velocity (m/sec)

g = gravitational acceleration (m/sec²)

No meteorological data is directly available for New Melones Lake; however three years of wind data was available from a nearby monitoring station in Angels Camp. For those three years, the wind statistics shown in **Table 3-1** were obtained.

Table 3-1: Wind statistics from Angels Camp (May 2008 through January 2011)

Item	Date	Wind Speed Max (mph)	Gust Speed Max (mph)
Typical summertime daily maximum wind speed		21	26
Maximum wind speed of record	1/20/2010	36	36
Maximum wind speed Gust of record	11/12/2009	7	71

Source: WeatherUnderground 2011

The wind speeds in **Table 3.1** are smaller than what anecdotal data would suggest for New Melones Lake. Therefore maximum wave heights were calculated from the wave fetch and observed wind speed of 60 mph in the winter¹ and an assumed 40 mph in the summer (**Table 3-2**). Note that the wind speed used in determining wave height is sustained wind speed, not gust speed.

Table 3-2: Exposure to wind and wave hazards

Site	Wind Fetch (ft.)	Max Wind Speed ¹ (mph)	Season	Max Wave Height (ft.)
Existing Marina (1)	29,900	60	Winter	5.0
Angels Creek (2)	3,600	60	Winter	2.1
Black Bart (3)	8,900	40	Summer	1.6

¹ Wind speeds are based on anecdotal data

Wave height incident from southeasterly storm winds was found for the existing marina and for Angels Creek. The existing marina is subject to a fetch of almost 30,000 feet (5.67 miles), while Angels Creek is subject to a fetch of 3,600 feet (0.68 miles) at low water. Black Bart is not subject to waves from southeasterly storm winds because there is no fetch over which to generate waves at this site. However, northwesterly winds during summer storms will result in waves at this site.

The wind fetch at both Angels Creek and Black Bart is substantially smaller than that at the existing marina. Therefore exposure to wind and wave action at both sites will be considerably less than that at the existing marina. The wind fetch at Angels Creek is smaller than that at Black Bart, but due to the direction of the prevailing wind, the maximum wave height is estimated to be smaller.

¹ Personal communication USBR New Melones Lake (2010)

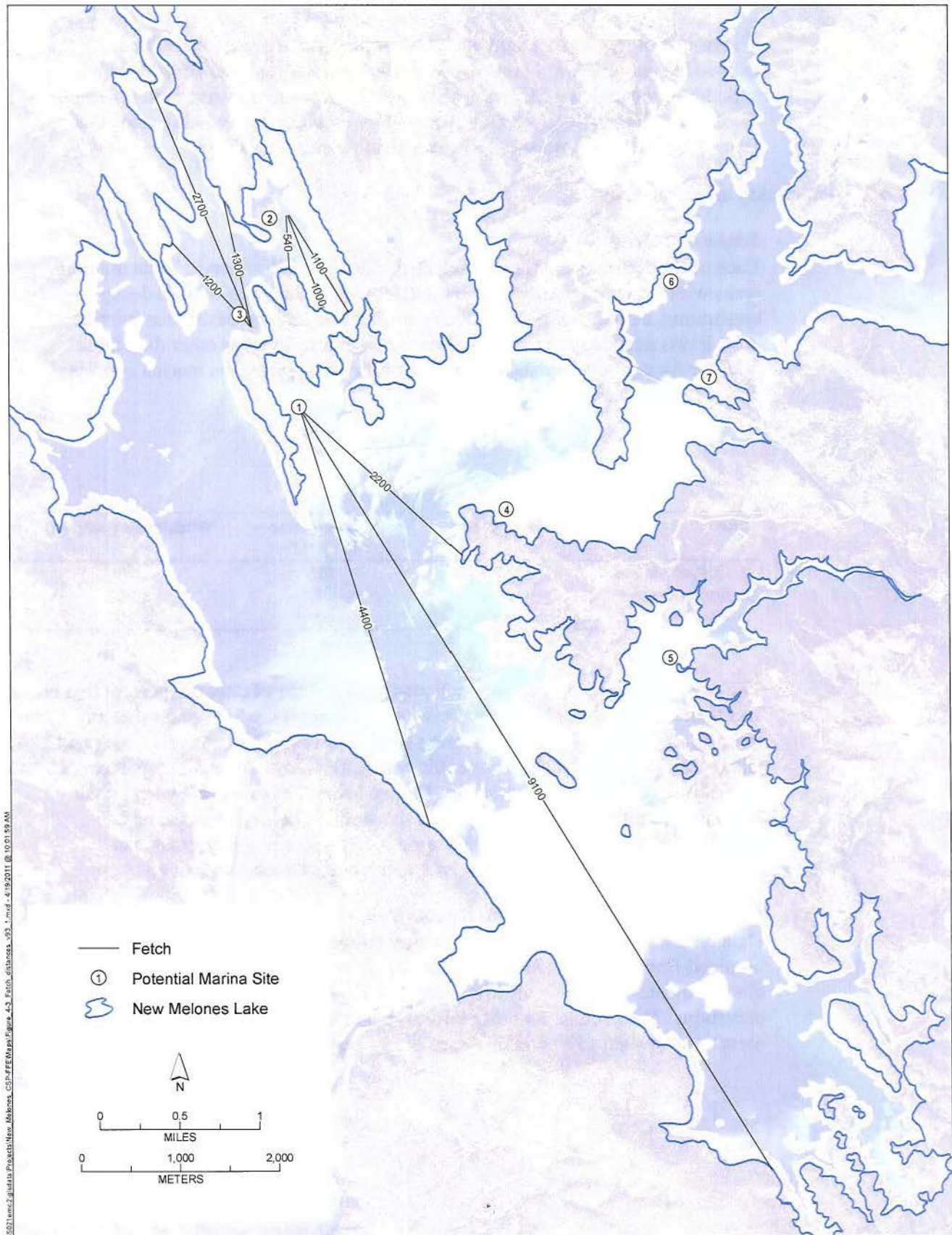


Figure 3-3

Wind fetch at proposed marina sites

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The results of our wave height analysis confirm that the existing marina is exposed to extreme wind hazards. Both the Angels Creek and Black Bart are superior to the existing Marina with respect to exposure to wave action. Despite the longer wind fetch, protection from winter southeasterly winds means that Black Bart is exposed to smaller waves than Angels Creek.

3.3.2 Adequacy of Location:

Slope of Terrain

Each of the alternative sites was selected based on preliminary criteria including areas with slope of less than 10 percent. However, due to minimum design constraints, namely the 920ft low water elevation, and the desire to minimize cost, it was necessary to locate marina access ramps in areas other than those with the least grade. The mean gradient of the bank where the marina concepts have been located are shown in **Table 3-3**.

Table 3-3: Slope of Terrain

Site	Mean Slope	Entrance Ramp – Floating (ft)	Wheelchair Ramp (ft)
1. Existing Marina	6.0%	150	NA
2. Angels Creek	24%	400	5,200
3. Black Bart	22.5%	400	3,900

The existing marina is accessed by a road with a slope of only 6.0 percent that is less than the ADA specifications for wheelchair access, which states that any ramp should not exceed an 8.3 percent slope. However, both Angels Creek and Black Bart are significantly above this with gradients of 24 and 22.5 percent respectively. Therefore, as shown in **Figure 3.2** and **Figure 3.3** a wheel chair ramp is required at both sites to reduce the gradient below the required 8.3 percent. The cost of the wheelchair ramp including railing is estimated at \$510,000 and \$730,000 for Black Bart and Angels Creek respectively.

Depth of Water (Seasonal Fluctuations)

Data on the seasonal fluctuations of water (stage) elevation at NML was obtained from the California Data Exchange Center (2010). Daily water stage elevation data was obtained, which was used to compute average monthly stage elevations. The average monthly low, high and annual change in water stage elevation between 1995 and 2010 are shown on **Figure 3-4**.

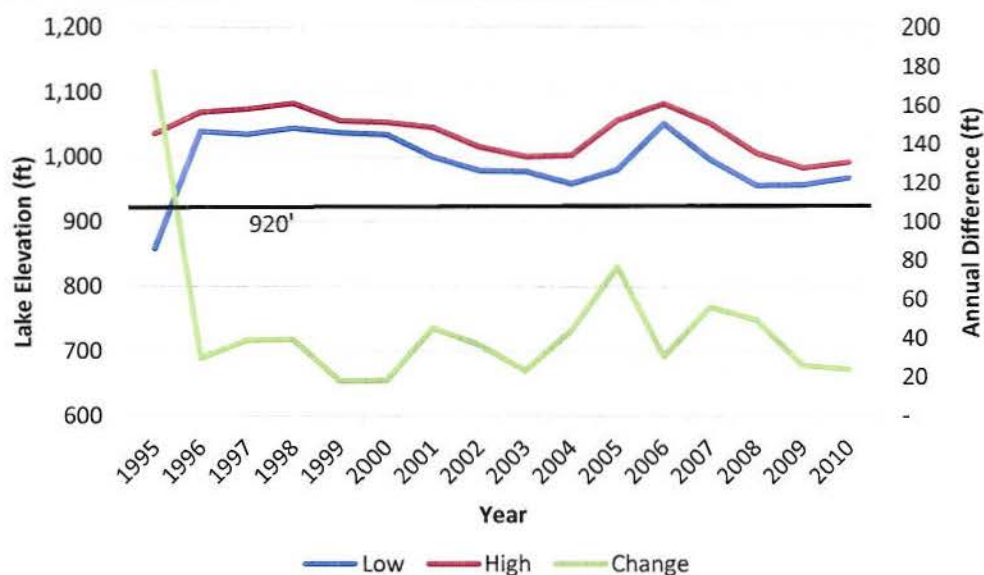


Figure 3-4: Average monthly low, high, and annual change in water stage elevation for NML between 1995 and 2010.

The data shows that apart from 1995 when the annual change in water elevation was close to 180 feet, typically the annual change in water stage elevation is less than 60 feet. The data also shows that only once (again in 1995) was the low water stage elevation below the marina design elevation of 920 feet.

The Angels Creek and Black Bart sites vary with respect to their proximity to deeper water. This difference is captured in the section below.

Available Area (Room to Accommodate Marina)

In determining the available area to accommodate a marina, an analysis was undertaken to determine the area of water available below three different surface elevations. The results of this analysis are shown in **Table 3-4**.

Table 3-4: Available water surface area within a 2000ft radius of each proposed site

Site	Elevation		
	≤920ft	≤870ft	≤840ft
1. Existing Marina	Not Available ¹		
2. Angels Creek (acres)	62.6	27.2	11.2
3. Black Bart (acres)	100.3	66.8	46.4

¹ The topographical data did not extend south of the existing marina to enable a fair comparison of available area.

As shown in **Table 3-4** the area available to accommodate a marina is greater at Black Bart compared to Angels Creek. This difference in the availability of deep water is increasingly noticeable as water levels decrease below the design low water level of 920ft. The available area below 840ft is four times larger at Black Bart compared with Angels Creek.

While limited elevation data was available from which to assess available area at the existing marina, the data that was available did show that the Black Bart site has a greater area of deep water in close proximity.

Accessibility (Traffic Flow and Safety)

Each of the alternative sites was selected based on preliminary criteria including areas within 1,000 feet of existing roads. Both the Angels Creek and Black Bart site can be accessed by existing road infrastructure. Any increase in traffic flow associated with a new Marina could increase the safety risk to day users at the alternative sites; however this would likely be minimal. Given that existing marina and Black Bart will use much of the same road and car parking infrastructure, the greatest change in traffic flow would likely be experienced at the Angels Creek site.

3.3.3 Availability of / Suitability for Infrastructure

Given the potentially high planning (including design and permitting) and construction costs associated with any new infrastructure, one of the key criteria used to short-list alternative sites (Chapter 2) was the availability of existing infrastructure. The differences between the short-listed alternatives are discussed below.

Water/Sewer/Power – Availability

At Angels Creek, a marina would require a water well and water distribution system, a new septic and extension of the septic line, and an extension of electrical distribution system from the rest room to the end of the access ramp. The costs for these items are estimated at \$277,500 as shown in **Table 5-1**, within **Item C**.

A new marina at Black Bart, could utilize the existing marina's water well. This site would however need a new septic system and an extension of the sewer line, and an extension of electrical distribution system from the rest room to the end of the access ramp. The costs for these items are estimated at \$134,100 as shown in **Table 5-2**, within **Item B**.

Launch Ramp Capacity

At Angels Creek, the launch ramp currently only extends to an elevation of 975-feet. If a marina was developed at this site, the launch ramp would need to be extended by 1,100 feet to reach the low water design elevation of 920 feet. The cost to extend the launch ramp is estimated at \$792,000 as shown in **Table 5-1**, within **Item C**.

A new marina at Black Bart, would utilize the main launch ramp at Glory Hole, hence no costs are included. Any water craft using the slips at Black Bart would need to boat a further distance around the point to access a marina at this location. The owners of watercraft would consider this a disadvantage of Black Bart compared with either Angels Creek or the existing marina.

Capacity/Potential for New Facilities

The only new facilities will be those required at Angels Creek. For any new marina, there is an advantage of using the workshop and maintenance facilities associated with the existing marina. However, given the distance between the workshop and the Angels Creek site, it is necessary to build a small storage office/shed on location. The area identified for location of an office/storage shed is the cleared area adjacent to the swimming beach on the access road to Angels Creek. The cost allocation for the office/storage shed is \$55,000 as shown in **Table 5-1**, within **Item C**.

No new car parking spaces were designed at either Angels Creek or Black Bart. Rather than build new parking infrastructure, any parking overflow could be captured using existing parking infrastructure and increased taxi service (at increased operational expense) to transport users to the marina.

3.3.4 Other Planning Considerations

Clearing Native Vegetation

The construction of an access trail at Black Bart would require native vegetation to be cleared. It is estimated that 20 mature Oak trees would need to be removed during construction. No clearing is anticipated at the Angels Creek site.

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Chapter 4

Marina Siting Requirements and Regulations

4.1 General Requirements

The development of new marina facilities at New Melones Lake would be subject to various regulations and requirements. However, because the marina site and design are still conceptual, it is not possible to determine all applicable requirements and regulations at this point in time. Therefore, this section provides a general overview of the regulatory environment for marina facilities.

First, there are internal provisions maintained by Reclamation. All uses on lands administered by Reclamation must be authorized in accordance with 43 CFR§429.31, which states that “a use authorization will not be granted when, in the judgment of Reclamation, the use cannot be reasonably accommodated on Reclamation land, facilities, or waterbodies because it would:

- Be incompatible with authorized Project purposes and project operations, safety, or security;
- Jeopardize the interests of the United States;
- Result in unacceptable impacts to the environment, natural or cultural resources, public health and safety that would be incompatible with applicable land use planning decisions or project operations;
- Violate state or local law, regulation, ordinances, or zoning;
- Be an otherwise inappropriate use of Federal property;
- Result in new private exclusive recreational or residential use of Reclamation land, facilities, or waterbodies.”²

4.2 Consistency with New Melones Lake RMP

The provisions outlined above for Reclamation lands have been incorporated into the New Melones Lake Resource Management Plan and Environmental Impact Statement (RMP/EIS) prepared in 2009. Specific to marina facilities, the Proposed Action considered in the RMP/EIS calls for commercial services that may include marina services with adequate storm protection. Further, it states

² Provisions related to exclusive use include, but are not limited to boat houses, docks, moorings, launch ramps, and floating structures or buildings, including moored vessels used as residences or business sites.

that the marina should be relocated within the Glory Hole Management Area (if feasible), with separate areas for private moorage and public rentals and services. It also calls for the construction of an appropriate wave attenuator for the marina or allow for seasonal operation to minimize storm damage. The RMP also allows for a seasonally-operated, additional marina services in appropriate locations in Rural Developed Management Areas, such as Tuttletown and Glory Hole, and/or appropriate locations in Rural Natural Management Areas, such as Parrotts Ferry, Greenhorn Creek, or Camp Nine. Potential services and amenities envisioned at marina facilities include dry storage, dry stacking, transient slips, restaurant or food service, and boat repair yard or boat repair. These services were also considered and recommended as part of the CSS.

4.3 Regulatory Environment

Although the proposed marina would be located on federal lands under Reclamation administration (subject to the provisions of the RMP/EIS), there are also a range of local, state and federal agencies that regulate environmental practices at marinas, which must be considered in the marina siting and development process.

4.3.1 General Requirements

The following general requirements may apply to development of new marina facilities at New Melones Lake:

- **California Department of Toxic Substances Control (DTSC) and Certified Unified Program Agencies (CUPAs).** Regulations pertaining to hazardous waste management are likely the most complex of all regulatory programs that may apply to California marinas. In California, local governments are charged with the authority for implementing hazardous waste regulations. In most instances, these local agencies are “Certified Unified Program Agencies” (or CUPAs). CUPAs implement local hazardous waste and materials management programs, above and underground storage tank programs, and hazardous materials emergency response programs for businesses. Most CUPA regulations follow the guidance set forth by DTSC for hazardous waste management. In the New Melones Lake area, the Calaveras County Environmental Health Department and Tuolumne County Environmental Health Department are the applicable CUPAs.
- **California Air Resources Board (ARB).** The Air Resources Board (ARB) is California's primary air pollution control authority. The ARB has regulatory authority over emissions from mobile sources of air pollution which include outboard engines, personal water craft (PWCs), stern drive engines and portable fuel containers. Responsibility for issuing permits for other air pollution sources rests with local and

regional Air Quality Management Districts. Marina operations that are typically regulated by the Air Districts include: fuel dispensing, boat painting, parts and other cleaning using solvents, back-up power generators above 50 horsepower and hull surfaces sandblasting. The Calaveras County Air Pollution Control District (APCD) and Tuolumne County APCD have jurisdiction in the New Melones Lake area.

- **California Department of Fish and Game – OSPR.** The Office of Spill Prevention and Response (OSPR) implements programs to certify small craft fueling facilities for spill prevention and oversees programs requiring marine fueling facilities to prepare spill contingency plans. The Department conducts enforcement regarding pollution discharges considered deleterious to fish, plants, and birds.
- **California Integrated Waste Management Board.** The CIWMB implements programs to reduce waste in California in partnership with local government, industry, and the public. Its programs focus on hazardous wastes, used oil, and solid waste. The CIWMB provides grants to local government that have been used to fund oil-related services for boaters at marinas throughout California.
- **Regional Water Quality Control Boards.** The Boards implement storm water and pollution discharge permits for marinas and conduct enforcement of water quality laws. Regional Boards also have the authority to require installation and maintenance of sewage pumpouts and to establish regional standards for adequate numbers of pumpouts. RWQCB Region 5, Central Valley Region, has jurisdiction at New Melones Lake.
- **State Water Resources Control Board.** The Board regulates discharges of pollutants to state waterways in order to protect water quality and the beneficial uses of the waters of the state. The Board, in partnership with the California Coastal Commission, implement's the state non-point source pollution control program, which includes environmental management measures for marinas and boating. The Board also implements regulations pertaining to vessel fueling facilities design, construction and operation.

In addition, the following regulations may also be applicable:

- Section 10 of the Rivers and Harbors Act of 1899 requires approval prior to the accomplishment of any work in or over navigable waters of the United States, or which affects the course, location, condition or capacity of such waters. The U.S. Army Corps of Engineers (USACE) has authority to regulate certain activities in navigable waters.

Regulated activities include diking, deepening, filling, excavating, and placing of structures.

- Section 404 of the Clean Water Act requires approval prior to discharging dredged or fill material into the waters of the United States, including wetlands. Under section 404 provisions, the USACE issues permits regulating the discharge of dredged or fill material into wetlands. Permits are subject to review and possible veto by the U.S. Environmental Protection Agency (EPA), and the U.S. Fish and Wildlife Service's (USFWS) has review and advisory roles.

Construction of marina facilities may require a National Pollutant Discharge Elimination System (NPDES) permit for discharges associated with construction activity. The NPDES permitting program regulates and issues permits for the discharge of pollutants to surface and ground waters of the State, pursuant to the State and Federal Acts, except for those activities specifically prohibited or exempted. Best Management practices need to be implemented in the construction, to ensure that erosion and transport of sediment to local waters is avoided and minimized.

4.3.2 Local Land Use Planning

As described above, land use policies and allowable uses in the New Melones Lake planning area are governed by the New Melones Lake RMP. Land use decisions and policies implemented by local land use agencies in Calaveras and Tuolumne counties provide guidance for management of lands adjacent to New Melones Lake, but do not directly apply to lands administered by Reclamation. However, Reclamation and local agencies attempt to keep informed about land use activities that may affect one another, and no use will be authorized by Reclamation that violates state or local law, regulation, ordinances, or zoning.

4.3.3 ADA Accessibility

The proposed marina would need to comply with the Americans with Disabilities Act of 1990 and 1995 (ADA) (29 USC, Section 794). These laws require that access to federal facilities be provided for persons with disabilities. New facilities in the New Melones Lake Area, such as a marina, are subject to ADA requirements. The RMP/EIS also calls for the incorporation of the "universal design approach to accessibility" into all new facilities and programs. As part of this requirement, Reclamation will conduct an accessibility review of all facilities at developed and undeveloped recreation areas not previously surveyed or in response to new requirements. When determining the applicable levels of accessibility, consideration will be given to a site's topography and natural features, the degree of structural modification, and visitors' expectations related to the recreational land use. It is the intent of Reclamation to provide accessibility to all visitors within the confines of topography, natural features, and cultural and modify facilities and programs to comply with ADA requirements.

4.3.4 Endangered Species

Compliance with the Endangered Species Act (ESA) will be required with any new marina development at New Melones Lake. The presence (or absence) of endangered species is site specific. To determine whether any federally-listed or candidate species may occur in the project area, Reclamation will coordinate with the USFWS and likely implement field surveys to confirm whether or not there exists potentially suitable habitat in the project area. If no habitat is present, no further action is required under the Endangered Species Act (ESA). If suitable habitat and/or endangered species are identified, a Biological Evaluation will be required to satisfy ESA criteria.

4.3.5 Cultural Resources

Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended, [16 USC 470, 36 CFR § 800] requires all federal agencies to take into account the effects of their undertakings on historic properties that are included in, or eligible for inclusion in, the National Register of Historic Places prior to the approval of the expenditure of any federal funds or to the issuance of any federal license or federal permit. Accordingly, Section 106 would apply to the development of new marina facilities at New Melones Lake if historic properties were located in the project's area of potential effects.

Under Section 106, federal agencies must seek to avoid adverse effects to historic properties, but if no alternatives exist, the agency must mitigate the adverse effect. In addition, federal agencies or their federally delegated authorities are required to consult with the State Historic Preservation Officer (SHPO) during the evaluation process.

The Section 106 process is typically undertaken in advance of or in conjunction with the National Environmental Policy Act (NEPA) compliance process, although they are separate laws. Under NEPA, a more comprehensive evaluation of cultural resource impacts are evaluated. Both processes are performed in the project planning stage, when adverse impacts to the environment can still be avoided or mitigated.

Cultural resource consideration would also need to be addressed under California Environmental Quality Act (CEQA), where public agencies must consider the effects of their actions on both "historical resources" and "unique archaeological resources." Pursuant to Public Resources Code (PRC) Section 21084.1, a "project that may cause a substantial adverse change in the significance of an historical resource is a project that may have a significant effect on the environment." Section 21083.2 requires agencies to determine whether proposed projects would have effects on "unique archaeological resources."

4.3.6 CEQA/NEPA Compliance

The relocation of existing marina facilities, as recommended in the CSS, will be subject to environmental compliance requirements under the NEPA and CEQA,

in addition to all other applicable regulations. To the extent that proposed commercial services are consistent with the range of alternatives considered in the New Melones Lake RMP/EIS, the environmental analysis presented in the RMP/EIS provides a programmatic level of compliance. However, a site-specific environmental analysis will be required prior to authorization from Reclamation for the relocation of marina facilities at New Melones Lake.

There are a wide range of environmental issues related to marina facilities that will likely be evaluated as part of the environmental compliance process. This marina siting study is focused on selecting a small group of sites suitable for marina development; accordingly, a range of alternatives are being developed which is required under NEPA. Once these sites are identified, the environmental review process will consider all potential environmental impacts that may occur with marina development. Typical environmental issues associated with marina facilities that would likely be considered in the environmental review process include, but are not limited to the following:

Physical Effects from Facility Development and Operations

- Impacts on terrestrial and marine native flora and fauna, including federal and state threatened and endangered species, and measures to minimize loss of native vegetation and habitat and prevent the spread of invasive plants and animals
- Impacts that water discharged from the marina would have on aquatic resources and measures to protect and maintain suitable water quality in waterways, particularly the management of run-off and the control of pollutant sources
- Air quality impacts during construction, including measures for the reduction or elimination of dust
- Noise impacts during construction, including measures by which noise levels could be reduced and contained to minimize impacts on surrounding land uses
- Visual impacts on the surrounding landscape, including views of and from the reservoir
- Effects of increased boating traffic and additional people on the surrounding environment
-

Facility Management

- Stormwater and wastewater management, including potential impacts on land resources and groundwater and waste management strategies for recreation visitors and commercial and recreational boats
- Impacts from maintenance dredging, including disposal options and impacts on the environment

Risk and Hazard Management

- Public safety impacts during construction and operations
- Phase I environmental site assessment to determine if there are any issues associated with land contamination on the project site
- Procedures and strategies to prevent, manage and mitigate pollution spills or sewage leaks
- Management of hazardous, flammable or explosive materials in the commercial areas or on boats
- Design of breakwaters
- Seismic risk to infrastructure

Effects on Communities and Human Environment

- Impacts of construction workforce on community resources and public services
- Impact on existing tourism and recreation activities and infrastructure
- Impact on road networks during construction and operation
- Social benefits attributed to enhancing recreational opportunities in the region

Socioeconomics

- Local socioeconomic effects, including changes in employment and income in recreation-support industries
- Economic effects the construction and ongoing workforce in the local and regional economy
- Potential costs or savings to local governments associated with infrastructure expansion for transportation networks, electricity supply, water supply, sewer, etc.

Land Use

- Consistency with the New Melones Lake RMP
- Potential impacts on and compatibility with surrounding land uses

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Chapter 5

Cost Estimate of Alternatives

5.1 Background

In February 2010, a condition assessment was completed for the existing marina at New Melones Lake. After assessing the condition of the marina facilities, an Opinions of Probable Cost (cost estimate) to replace unusable components determined to have a remaining useful life of 5 years or less was prepared.

The cost to replace these unusable components represents the approximate cost to refurbish the marina in its present location. An estimate of the cost to relocate useable components to another, more sheltered location on the lake was also prepared. The replacement cost for unusable components added to the cost to relocate useable facilities approximated the cost for providing a marina at a different location on the lake. In addition, a cost estimate covering the removal and replacement of all marina components at the current site regardless of age or condition was also prepared. The results of the condition assessment and the cost estimates described above are documented in the CSS prepared by Reclamation (April 2011).

The current cost estimates for the Black Bart site and the Angels Creek site make use of applicable cost data developed previously for the April 2011 CSS wherever possible. Land-based costs were developed for both sites based on the concepts of design shown in **Figure 3-1** and **Figure 3-2** and added to the water-based costs. Water-based costs include two options, refurbishing and relocating reusable components from the existing marina and constructing all new water-based facilities. The cost for new anchorages at each site is included in the water-based costs.

5.2 Cost Estimates

Cost estimates for various components of the new marina at the Angels Creek and Black Bart marina sites are summarized on **Table 5-1** through **Table 5-4**. All estimates include contractor markup, design contingencies, and escalation to 2012 dollars.

Table 5-1: Class 4 Conceptual - Level Estimate - Angels Creek Land-Based Components

Item	Description	Quantity	Unit	Unit Price	Amount	Total
A	Shore Improvements					\$ 788,146
	Main Ramp - Concrete 10ft. Wide	7,376	SF	\$ 24.00	\$ 177,024	
	Trail - Asphalt 10ft. Wide	16,269	SF	\$ 22.00	\$ 357,914	
	Add Fuel Truck Turn Around	2,000	SF	\$ 22.00	\$ 44,000	
	Wheel Chair Ramp - Concrete 5ft. Wide	8,717	SF	\$ 24.00	\$ 209,208	
B	Ramp Improvements					\$ 709,310
	Wheel Chair Ramp - 5' X10" Landing	17	EA	\$ 2,800.00	\$ 47,600	
	Main Ramp - 5' X10" Landing	17	EA	\$ 2,800.00	\$ 47,600	
	Wheel Chair Ramp - 5' X5" Landing	34	EA	\$ 1,600.00	\$ 54,400	
	Main Ramp - Railing	1,646	LF	\$ 75.00	\$ 123,450	
	Trail - Railing	3,264	LF	\$ 55.00	\$ 179,520	
	Wheel Chair Ramp - Railing	3,928	LF	\$ 55.00	\$ 216,040	
	Rail Landing for Chair Ramp	740	LF	\$ 55.00	\$ 40,700	
C	Site Improvements for Development					\$ 1,124,512
	Provide On-Site Office/Storage Building	1	AL	\$ 55,000.00	\$ 55,000	
	Extend Sewer Line	1,700	LF	\$ 20.00	\$ 34,000	
	Septic System Replacement Allowance	1	AL	\$ 50,000.00	\$ 50,000	
	Extend Water Line	1,700	LF	\$ 18.00	\$ 30,600	
	Extend Electrical from rest room	1,700	LF	\$ 40.00	\$ 68,000	
	Power Termination	1	LS	\$ 10,000.00	\$ 10,000	
	Extend Boat Launch Ramp	99,000	SF	\$ 8.00	\$ 792,000	
	Install Water Pump System	1	EA	\$ 2,800.00	\$ 2,800	
	Install Flex Connection	5	EA	\$ 900.00	\$ 4,500	
	Upgrade Electric Switch Gear at (E)					
	Restroom	1	LS	\$ 18,000.00	\$ 18,000	
	Extend Utility Service to (N) Dock & Site	2,129	LF	\$ 28.00	\$ 59,612	
Sub-total						\$ 2,621,968
	Contractor Mark-up		%	15%	\$ 393,295	
Sub-total						\$ 3,015,263
	Design Contingency		%	20%	\$ 603,053	
Sub-total						\$ 3,618,315
	Escalation to 2012		%	4%	\$ 144,733	
Total						\$ 3,763,048

Exclusions for Table 5-1

- 1 Dump Fees or Salvage Value
- 2 Replacement of Existing Items Not Priced
- 3 Service Yard or Maintenance Functions
- 4 Propane Barge, Fireboat, or Gov. Boat Slip
- 5 Wave Rider Floats
- 6 Offsite Infrastructure
- 7 Provision of Temporary Power
- 8 Paving or Grading for New Access Road(s)
- 9 Equipment or Material for Extension of MEP from Main POC due to Water Height Fluctuation
- 10 Landscaping
- 11 Parking Bumpers
- 12 Land Based Buildings Other Than Maintenance Building Under Item C
- 13 Wave Attenuation
- 14 Power to Transformer Location
- 15 Telephone Service to Marina
- 16 Signage
- 17 EIR or Geotechnical Study
- 18 Habitat or Offsite Mitigation
- 19 Permit or Fees
- 20 Design, CM or USBR Staff Support Costs

Table 5-2: Class 4 Conceptual - Level Estimate - Black Bart Land-Based Components

Item	Description	Quantity	Unit	Unit Price	Amount	Total
A	Shore Improvements					\$1,041,544
	10' Wide Main Ramp Concrete	8,334	SF	\$ 32.00	\$266,688	
	10' Wide Trail Asphalt	8,806	SF	\$ 36.00	\$317,016	
	Add Fuel Truck Turn Around	2,000	SF	\$ 22.00	\$ 44,000	
	5' Wide Wheel Chair Ramp Concrete	11,902	SF	\$ 30.00	\$357,066	
	Small Access Paths	1,500	LF	\$ 15.00	\$ 22,500	
	Excavate for path (Cut to fill where possible)	137	CY	\$ 250.00	\$ 34,274	
B	Ramp Improvements					\$1,378,579
	5' X 10' Landing on Wheelchair Ramp	18	EA	\$ 2,800.00	\$ 50,400	
	5' X 10' Landing on Main Ramp	19	EA	\$ 2,800.00	\$ 53,200	
	5' X 5' Landing on Wheel Chair Ramp	36	EA	\$ 1,800.00	\$ 64,800	
	Main Ramp - Railing	6,700	LF	\$ 75.00	\$502,500	
	Trail - Railing	3,264	LF	\$ 55.00	\$179,520	
	Wheel Chair Ramp - Railing	5,193	LF	\$ 55.00	\$285,599	
	Railing Landing for Chair Ramp	740	LF	\$ 55.00	\$ 40,700	
	Provide Boat Dock	120	LF	\$ 180.00	\$ 21,600	
	Provide Boat Dock Lighting	120	LF	\$ 18.00	\$ 2,160	
	Extend Sewer Line	950	LF	\$ 20.00	\$ 19,000	
	Septic System Replacement Allowance	1	AL	\$50,000.00	\$ 50,000	
	Extend Water Supply Line (E) Marina	950	LF	\$ 18.00	\$ 17,100	
	Extend Electrical from rest room	950	LF	\$ 40.00	\$ 38,000	
	Power Termination	1	LS	\$10,000.00	\$ 10,000	
	Allowance for Path Lighting	600	LF	\$ 15.00	\$ 9,000	
	Remove Oak Trees & Dispose	20	EA	\$ 600.00	\$ 12,000	
	Additional Tree's to Mitigate Removal	30	EA	\$ 700.00	\$ 21,000	
	Provide Additional Faucets	5	EA	\$ 400.00	\$ 2,000	
Sub-total						\$2,420,122
Sub-total	Contractor Mark-up		%	15%	\$363,018	\$2,783,141
Sub-total	Design Contingency		%	20%	\$556,628	\$3,339,769
Sub-total	Escalation to 2012		%	4%	\$133,591	\$3,473,360
Total						\$3,473,360

Exclusions for Table 5-2

- 1 Replacement of Existing Items Not Priced
- 2 Dump Fees or Salvage Value
- 3 Service Yard or Maintenance Functions
- 4 Propane Barge, Fireboat, or Gov. Boat Slip
- 5 Wave Rider Floats
- 6 Offsite Infrastructure
- 7 Provision of Temporary Power
- 8 Paving or Grading for New Access Road(s)
- 9 Well or Water Line to New Location
- 10 Wave Attenuation

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- 11 Power to Transformer Location
- 12 Repair or Refurbishment of Reallocated Items
- 13 Telephone
- 14 Signage
- 15 EIR or Geotechnical Study
- 16 Habitat or Offsite Mitigation
- 17 Permit or Fees
- 18 Design, CM or Staff Support Costs

Table 5-3: Class 4 Conceptual - Level Estimate - Water-Based With Re-Use

Item	Description	Quantity	Unit	Unit Price	Amount	Total
B	Marina Utility Shed					\$ 21,150
	Demo	150	SF	\$ 6.00	\$ 900	
	Substructure	150	SF	\$ 35.00	\$ 5,250	
	Shed	150	SF	\$ 100.00	\$ 15,000	
C	Covered Boat Dock - East					\$ 234,203
	Demo	7,178	SF	\$ 3.50	\$ 25,123	
	Dock	1,872	SF	\$ 35.00	\$ 65,520	
	Dock Cover	7,178	SF	\$ 20.00	\$ 143,560	
D	Mooring Dock					\$ -
E	Covered Boat Dock - Central					\$ -
F	House Boat Dock - West					\$ -
G	House Boat Service Dock					\$ 91,920
	Demo	1,640	SF	\$ 3.00	\$ 4,920	
	Substructure	1,540	SF	\$ 50.00	\$ 77,000	
	Service Shed	100	SF	\$ 100.00	\$ 10,000	
H	Marina Store					\$ 773,200
	Demo	5,200	SF	\$ 6.00	\$ 31,200	
	Substructure	5,200	SF	\$ 35.00	\$ 182,000	
	Structure	2,800	SF	\$ 200.00	\$ 560,000	
I	Dock Attached to Marina Store					\$ 205,200
	Demo	5,400	SF	\$ 3.00	\$ 16,200	
	Main Dock	5,400	SF	\$ 35.00	\$ 189,000	
J	Entrance Ramp					\$ 164,000
	Removal to Above High Water Line	400	LF	\$ 50.00	\$ 20,000	
	Ramp	400	LF	\$ 360.00	\$ 144,000	
K	Gas Dock					\$ 87,600
	Demo	1,200	SF	\$ 3.00	\$ 3,600	
	Dock	1,200	SF	\$ 45.00	\$ 54,000	
	Services	1,200	SF	\$ 25.00	\$ 30,000	
L	House Boat Anchorage					\$ 654,500
	Cable	19,500	SF	\$ 10.00	\$ 195,000	
	Mooring Ball Anchors	50	SF	\$ 7,500.00	\$ 375,000	
	Adjustment Wrench	1	SF	\$ 3,500.00	\$ 3,500	
	Main Stays	9	SF	\$ 5,000.00	\$ 45,000	
	Land Caissons	18	SF	\$ 2,000.00	\$ 36,000	
M	Relocate Water Based Infrastructure					\$ 50,000
	Relocation Allowance	1	AL	\$ 50,000.00	\$ 50,000	
N	House Boat Anchorage					\$ 674,500
	Removal to Above High Water Line	1	AL	\$ 20,000.00	\$ 20,000	
	Cable	19,500	SF	\$ 10.00	\$ 195,000	
	Mooring Ball Anchors	50	SF	\$ 7,500.00	\$ 375,000	
	Adjustment Wrench	1	SF	\$ 3,500.00	\$ 3,500	
	Main Stays	9	SF	\$ 5,000.00	\$ 45,000	
	Land Caissons	18	SF	\$ 2,000.00	\$ 36,000	
Sub-total						\$ 2,956,273
Sub-total				Contractor Mark-up	% 15%	\$ 443,441
						\$ 3,399,714
Sub-total				Design Contingency	% 15%	\$ 509,957
						\$ 3,909,671
Sub-total				Escalation to 2012	% 4%	\$ 156,387
Total						\$ 4,066,058

**Table 5-4: Class 4 Conceptual - Level Estimate - Water-Based - 100%
Replacement of Floating Components**

Item	Description	Quantity	Unit	Unit Price	Amount	Total	Estimated Useful Life (Yrs)
B	Marina Utility Shed					\$ 21,150	30
	Demo	150	SF	\$ 6.00	\$ 900		
	Substructure	150	SF	\$ 35.00	\$ 5,250		
	Shed	150	SF	\$ 100.00	\$ 15,000		
C	Covered Boat Dock - East					\$ 230,614	30
	Removal to Above High Water Line	7,178	SF	\$ 3.00	\$ 21,534		
	Dock	1,872	SF	\$ 35.00	\$ 65,520		
	Dock Cover	7,178	SF	\$ 20.00	\$ 143,560		
D	Mooring Dock					\$ 102,600	30
	Removal to Above High Water Line	2,700	SF	\$ 3.00	\$ 8,100		
	Dock	2,700	SF	\$ 35.00	\$ 94,500		
	Shed		SF		\$ -		
E	Covered Boat Dock - Central					\$ 303,699	30
	Removal to Above High Water Line	8,773	SF	\$ 3.00	\$ 26,319		
	Dock	2,912	SF	\$ 35.00	\$ 101,920		
	Dock Cover	8,773	SF	\$ 20.00	\$ 175,460		
F	House Boat Dock - West					\$ 413,617	30
	Removal to Above High Water Line	9,619	SF	\$ 3.00	\$ 28,857		
	Dock	9,619	SF	\$ 35.00	\$ 336,665		
	Services	9,619	SF	\$ 5.00	\$ 48,095		
G	House Boat Service Dock					\$ 91,920	30
	Demo	1,640	SF	\$ 3.00	\$ 4,920		
	Substructure	1,540	SF	\$ 50.00	\$ 77,000		
	Service Shed	100	SF	\$ 100.00	\$ 10,000		
H	Marina Store					\$ 773,200	30
	Removal to Above High Water Line	5,200	SF	\$ 6.00	\$ 31,200		
	Substructure	5,200	SF	\$ 35.00	\$ 182,000		
	Structure	2,800	SF	\$ 200.00	\$ 560,000		
I	Dock Attached to Marina Store					\$ 205,200	30
	Demo	5,400	SF	\$ 3.00	\$ 16,200		
	Main Dock	5,400	SF	\$ 35.00	\$ 189,000		
J	Entrance Ramp					\$ 164,000	30
	Removal to Above High Water Line	400	LF	\$ 50.00	\$ 20,000		
	Ramp	400	LF	\$ 360.00	\$ 144,000		
K	Gas Dock					\$ 87,600	20
	Removal to Above High Water Line	1,200	SF	\$ 3.00	\$ 3,600		
	Dock	1,200	SF	\$ 45.00	\$ 54,000		
	Services	1,200	SF	\$ 25.00	\$ 30,000		
L	House Boat Anchorage					\$ 674,500	40
	Removal to Above High Water Line	1	AL	\$ 20,000.00	\$ 20,000		
	Cable	19,500	SF	\$ 10.00	\$ 195,000		
	Mooring Ball Anchors	50	SF	\$ 7,500.00	\$ 375,000		
	Adjustment Wrench	1	SF	\$ 3,500.00	\$ 3,500		
	Main Stays	9	SF	\$ 5,000.00	\$ 45,000		
	Land Cessions	18	SF	\$ 2,000.00	\$ 36,000		
Sub-total						\$ 3,068,100	
Sub-total	Contractor Mark-up		%	15%	\$ 460,215	\$ 3,528,315	
Sub-total	Design Contingency		%	15%	\$ 529,247	\$ 4,057,562	
Sub-total	Escalation to 2012		%	4%	\$ 162,302	\$ 4,219,865	
Total						\$ 4,219,865	

Table 5-1 provides the cost estimate to construct the land-based components at the Angels Creek site. The total cost is approximately \$3,763,000. It includes extending the existing boat launch ramp at the parking lot by approximately 1,100 feet and providing a new maintenance building (20 feet by 40 feet).

Table 5-2 provides the cost estimate to construct the land-based components at the Black Bart site. The total cost is approximately \$3,473,000.

Table 5-3 provides the cost for water-based facilities assuming that reusable components from the existing marina are refurbished and moved to the new site. The cost is approximately \$4,066,000. This cost includes new anchorages and the total is the same for both alternative sites. **Table 5-3** differs from a comparable table in the *Commercial Services Study* (USBR 2011), primarily due to the equipment relocation costs and cost for new anchorages.

Table 5-4 provides the cost for 100 percent replacement of water-based facilities. The cost is approximately \$4,220,000 and is the same for both alternative sites. This cost is slightly higher than one provided previously in the *Commercial Services Study* (USBR 2011), due to a quantity increase for the Entrance Ramp (**Table 5-4, Item J**).

5.3 Costs for a Floating Breakwater (Existing Marina)

In analyzing the suitability of different sites for a marina at New Melones, we explored the possibility of reducing exposure to waves by installing a floating concrete breakwater at the existing marina. Two manufacturers were contacted to firstly determine whether a breakwater would be feasible, and secondly identify the typical costs involved. The two companies contacted were Concrete Technology Corporation in Tacoma, Washington, and SF Marina USA in Gloucester, Virginia.

To protect the existing marina from storm waves, a heavy, floating concrete box breakwater with a length about 500 feet is needed. The actual length, width, and draft of the breakwater would need to be determined via further detailed analysis, but as a gross estimate assume the breakwater could be 30 feet wide with a 6 foot draft to be effective against four foot waves.

One vendor (Concrete Technologies, Inc.) specified the fabrication cost for such a breakwater as \$150 per square foot of deck area. For a 500 foot long by 30 foot wide breakwater, surface area is 15,000 square feet, resulting in a cost of \$2.25 million. Additional cost would be required for transport, installation, and mooring. Concrete Technologies, Inc. fabricates their breakwaters at their factory dry dock, and then floats them by tug out to their intended mooring location. Since New Melones cannot be accessed in this manner, transport costs are currently unknown.

Another vendor (SF Marina USA) indicated lower costs of \$100 to \$105 per square foot for the breakwater delivered. They claim that this cost does include anchoring costs (25-35 per cent of the delivered cost); although state that deep water at New Melones Lake may necessitate more costly cables.

In addition to capital costs, additional maintenance costs would be required on the breakwater's moorings after storms.

5.4 Total Cost Comparison

The estimates presented on **Table 5-1** through **Table 5-4** are summarized in **Table 5-5** for the two alternative sites.

Table 5-5: Alternative Marina Sites - Conceptual Cost Comparison

Scenario	Existing Marina	Black Bart Site	Angels Creek Site
Cost Element - Refurbish Existing			
Land-Based Infrastructure ¹	\$0 ¹	\$3,473,360	\$3,763,048
Water-Based Refurbish and Relocate	\$2,947,170	\$4,066,058	\$4,066,058
Floating Concrete Breakwater	\$2,250,000	\$0	\$0
<i>Total Cost with Reused Water-Based Facilities</i>	<i>\$5,197,170</i>	<i>\$7,539,417</i>	<i>\$7,829,106</i>
Cost Element - With All New Facilities			
Land-Based Infrastructure	\$719,472	\$3,473,360	\$3,763,048
New Water-Based Facilities	\$4,013,033	\$4,219,865	\$4,219,865
Floating Concrete Breakwater	\$2,250,000	\$0	\$0
<i>Total Cost with New Water-Based Facilities</i>	<i>\$6,982,505</i>	<i>\$7,693,224</i>	<i>\$7,982,913</i>

1. The cost estimate for water based facilities includes \$75,000 to refurbish land based infrastructure

As can be seen in **Table 5-5**, the costs to build/replace a new marina is least at the existing site and greatest for the Angels Creek site. However, if we consider using all new infrastructures, the cost differential between the existing marina and the next cheapest alternative (Black Bart) is only approximately \$711,000. This difference could easily be within the cost uncertainty associated with the floating concrete breakwater.

The cost differential between reusing water-based components and constructing new water-based facilities at Black Bart and Angels Creek sites is only approximately \$154,000, with the reuse option being the least expensive.

The cost estimates includes double-wall piping and connection points for sewage and potable water from the high water mark out to the floating facilities. It is assumed that existing portable electrical boxes and cable from the existing marina will be reused to supply power from the high water mark to the floating facilities. The cost for a hard electrical connection point near the high water mark is included. The cost estimates assume that fuel will be delivered from a

truck using portable double-wall hose. No cost allowance is included for providing double-wall fuel piping on ramps or docks as a permanent component of the project. A turn-around area has been provided for the truck near the landside end of the access ramp.

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Chapter 6

Summary of Findings and Recommended Next Steps

The purpose of this study was to evaluate the most appropriate location for marina facilities at New Melones Lake. The study commenced with an initial evaluation of six sites; within developed recreation areas in Glory Hole, Mark Twain and Tuttletown.

An initial high level analysis of these sites, which focused on their proximity to roads and the availability of utilities and infrastructure, resulted in the six sites being reduced to two sites at Glory Hole Recreational Area. These two sites were the Angels Creek and Black Bart sites shown on **Figure 2-2**.

This study then analyzed site-specific characteristics of these two sites, such as wind and wave exposure, water depth, the slope of terrain, the availability of deep water (marina expansion) and the costs for developing each site. The study did not look at revenue, because the same marina capacity was assumed at each location. An analysis of additional revenue from expanding marina services was beyond the scope of this Marina Siting Plan.

The criteria analyzed within this study were scored between +2 and -2 to identify the preferred site; where:

- +2 Substantially Better
- +1 Somewhat Better
- 0 Same As Existing Marina
- 1 Somewhat Worse
- 2 Substantially Worse

In reviewing the scores shown in **Table 6-1**, it is important to recognize that some of the criteria are also reflected in the financial cost. For example, utilities have to be provided at Black Bart and Angels Creek; however these additional costs are included in the cost estimate. Likewise, the launch ramp at Angels Creek is above the 920 foot design level (which is given a score of +1); however costs to extend the ramp are included in the cost estimate (see **Table 5-1, Item C**). The only criterion of benefit that is not represented in the cost estimate is that of “available area”.

Table 6-1: Summary of Site Selection Criteria

	Existing Marina	Angels Creek	Black Bart
Cost			
<i>Financial Cost (100% new)</i>	\$6,982,505	\$7,982,913	\$7,693,224
Benefits			
<i>Adequacy of Exposure</i>			
Wind/Wave Exposure	+1	+2	+2
<u>Subtotal</u>	<u>+1</u>	<u>+2</u>	<u>+2</u>
<i>Adequacy of Location</i>			
Slope of Terrain	0	-2	-2
Depth of Water	0	0	0
Available Area	0	-1	+2
Accessibility	0	0	0
<u>Subtotal</u>	<u>0</u>	<u>-3</u>	<u>0</u>
<i>Availability/Suitability for Infrastructure</i>			
Water/Sewer/Power Availability	0	-1	-1
Launch Ramp Capacity	0	-1	0
Capacity/Potential for New Facilities	0	0	0
<u>Subtotal</u>	<u>0</u>	<u>-2</u>	<u>-1</u>
<i>Other Planning Considerations</i>			
Native Vegetation	0	0	-1
<u>Subtotal</u>	<u>0</u>	<u>0</u>	<u>-1</u>

The financial cost for the existing marina includes a cost of \$2.25 million to install a floating concrete breakwater. It is uncertain how effective this will be mitigating wind/wave exposure, which is why it was given a score of only +1, somewhat better than the existing marina.

In summary, the least cost alternative will be to refurbish the existing marina and build a substantial floating concrete breakwater (500 feet) to reduce exposure to wind and wave hazards. There is however significant uncertainty associated with this option with respect to the cost of the breakwater, its on-going maintenance cost, and its effectiveness at reducing wave height and hence storm damage.

Of the two alternative sites considered, the superior site is that at Black Bart. The advantage of this site compared with Angels Creek is the availability of deep water for marina expansion. A marina at this site would not need to move large distances were New Melones Lake levels to become lower than the 920 feet. Further, a marina at this site would reuse many of the land based facilities of the existing marina, further reducing its footprint compared with Angels Creek.

In reviewing the findings of this Marina Siting Plan, the opportunity to operate the Angels Creek Site as a seasonal operation was proposed. The advantage of a seasonal operation at Angels Creek is a reduced need to extend the boat launch ramp, and a reduction in the need to extend access trails and ramps. These changes would substantially reduce the capital cost for shore improvements. Annual revenue from a seasonal marina would be reduced; however, the reduced use of marina facilities in the quiet season (November through May)

would minimize any impacts. An assessment of financial feasibility for a seasonally operated marina was beyond the scope of this Marina Siting Plan; however, upon initial review it appears feasible.

The recommended next steps are to:

- Undertake wave modeling to determine whether a concrete breakwater is technically and financially feasible
- Investigate the financial feasibility of a seasonally operated marina at Angels Creek
- Develop a prospectus for a new marina at the preferred location.

Chapter 7 References

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